

REMARKS

Applicant thanks the Examiner for the opportunity to discuss aspects of this case in a telephonic interview of January 21, 1999. Applicant notes that the substance of the interview consisted of proposed amendments to overcome the rejections under 35 U.S.C. § 112, and discussion in rebuttal of the objection under 35 U.S.C. § 132. Applicant further notes that no art rejections were discussed.

Election/Restriction

The Examiner has withdrawn claims 27-29 as directed to an invention distinct from the invention originally claimed; and has withdrawn them from consideration based on prosecution on the merits of the original invention. Applicant hereby acknowledges withdrawal of claims 27-29, and cancels claims 27-29 without traverse, but reserves the right to resubmit them at a later time in a divisional application.

Objection to Specification Under 35 U.S.C. § 132

The amendment filed December 1, 1997 was objected to under 35 U.S.C. § 132 as introducing new matter into the disclosure. Specifically, the rejection states, "The added material which is not supported by the original disclosure is as follows: that the lamps be positioned to illuminate the reaction volume of gas 'above the surface of the substrate'." The rejection continues, "Applicant's disclosure does not teach where the illumination of the gas volume occurs in relation to the substrate, such as 'above' the substrate." While Applicant hereby removes the language objected to, Applicant feels obliged to address the rejection.

The specification clearly teaches, in multiple places, that one process of the invention includes "exposing the reaction volume of the gases *above* the substrate surface to a high intensity light source" See, e.g., specification, p. 5, ll. 4-5 and p. 5, ll. 19-20 (emphasis added). As the Examiner has noted, the specification further teaches that it is not necessary to illuminate the substrate surface. Office Action, p. 6, ll. 3-4; Specification, p. 7, ll. 23-24. The specification continues, "This process is different from photon-assisted CVD, where it is the substrate reaction surface on which photons are directed to increase reaction rates."

Specification, p. 7, ll. 24-26. Accordingly, Applicant respectfully submits that there is ample support in the specification as filed for illuminating the reaction volume of gas above the surface of the substrate, without directly illuminating the surface of the substrate.

In light of the amendment, Applicant respectfully requests reconsideration and withdrawal of the objection under 35 U.S.C. § 132.

Rejection Under 35 U.S.C. § 112

35 U.S.C. § 112, second paragraph

Claims 1, 23, 25 and 26 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and claim the subject matter of the invention. Claims 25 and 26 are canceled hereby without prejudice.

As to pending claims 1 and 23, the rejection asserts that “it is not clear what the meets and bounds of ‘a chemically reactive distance of the substrate’ would be.” While applicant herein amends claims 1 and 23 to remove the language objected to in the rejection, Applicant feels obliged to address some aspects of the rejection.

The rejection asserts, “The confusion arises because applicant’s description of the gas volume as being located where heterogenous [sic] reactions (surface reactions) take place and the fact that the gas volume is ‘within a chemically reactive distance of the substrate’ would lead one of ordinary skill in the art to believe the that [sic] particular volume of gases were reacting *with* the surface of the substrate or at least extremely near the surface of the substrate in order to be able to react *with* the substrate.” Office Action, part 3, para. 3 (emphasis added). Applicant respectfully submits that the rejection mischaracterizes the nature of the chemical reaction in requiring reaction with the surface of the substrate. While Applicant’s disclosure does not prohibit reaction with the substrate, neither does it require reaction with the substrate. Applicant further respectfully submits that the rejection mischaracterizes the nature of the reaction volume as including only those reactant gases actively involved in heterogeneous reactions. While reactant gases in the reaction volume take part in heterogeneous chemical reactions, there is no limitation that the reaction volume include only those gases immediately taking part in heterogeneous chemical reactions at the substrate surface.

The rejection asserts there is an apparent contradiction in how to illuminate the gases without illuminating the substrate. Applicant respectfully submits that illuminating the substrate surface, as used in the specification, is the act of directing photons at the substrate surface from a light source. See specification, p. 7, ll. 23-26. Thus, Applicant respectfully submits that it was within the ordinary skill in the art at the time the application was filed to illuminate gases located within the reaction chamber without directing photons at the substrate surface.

In light of the amendments, Applicant respectfully requests reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, second paragraph, and allowance of claims 1 and 23.

35 U.S.C. § 112, first paragraph

Claims 1-24 and 26 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to enable one skilled in the art to make/use the invention. Claim 26 is canceled hereby without prejudice.

The rejection asserts, "For the reasons given above, one of ordinary skill in the art would not understand how to illuminate 'a gas volume located within a chemically reactive distance of the substrate' without illuminating the substrate." As noted in the discussion under 35 U.S.C. § 112, second paragraph, Applicant respectfully submits that it was within the ordinary skill in the art at the time the application was filed to illuminate gases located within the reaction chamber without directing photons at the substrate surface. Accordingly, and in light of the amendments, Applicant respectfully requests reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, first paragraph, and allowance of claims 1-24.

Rejection Under 35 U.S.C. § 102(b)

Claims 25 and 30 were rejected under 35 U.S.C. § 102(b) as being anticipated by JP 2-050966 (Hisamune). Claim 25 is canceled hereby without prejudice.

The rejection states, "Hisamune clearly teaches applicant's invention (see Purpose and Constitution)." The rejection continues that the process of Hisamune is "very similar" to Applicant's disclosed process. Applicant respectfully submits that this is an improper basis for

rejection under 35 U.S.C. § 102(b) which requires that the reference teach each element of the claimed invention, not merely a “very similar” invention.

The Purpose and Constitution cited by the rejection appear in an abstract of the Hisamune reference. Applicant has carefully reviewed the Purpose and Constitution, along with the translation of the complete Hisamune reference provided to the Office in Applicant’s previous Response dated November 25, 1997, and is unable to locate a teaching of illuminating gases located within the reaction chamber without illuminating the substrate surface. Accordingly, Applicant respectfully submits that Hisamune fails to teach each element of the claimed invention.

Applicant respectfully requests reconsideration and withdrawal of the rejection under 35 U.S.C. § 102(b), and allowance of claim 30.

Rejection Under 35 U.S.C. § 103

Claims 1-24 and 26 were rejected under 35 U.S.C. § 102(b) as anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as obvious over JP 2-050966 (Hisamune). Claim 26 is canceled hereby without prejudice.

The rejection states, “Hisamune clearly teaches applicant’s process of illuminating ozone and a silicon source gas with a mercury arc lamp to deposit silicon dioxide onto a wafer surface.” As noted above, Hisamune fails to teach illuminating gases located within the reaction chamber without illuminating the substrate surface.

The rejection further states, “Hisamune teaches a deposition temperature of about 400°C and applicant claims about 480°C. Temperatures about 400°C, such as 440°C, would also be about 480°C. Therefore the Hisamune reference anticipates applicant’s deposition temperature.” Applicant respectfully objects to this extrapolation. The logic of the rejection could be extended in either direction to conclude that any temperature is the same as any other temperature, just by varying the number of steps in the extrapolation. Applicant respectfully submits that the cited reference, standing alone, does not teach nor suggest Applicant’s deposition temperature of about 480°C.

The rejection continues, "Hisamune further teaches that the reason for irradiating the inside of the reaction furnace with UV radiation is to induce a photochemical reaction of the gaseous starting materials with ozone (translation, p. 5, lns. 20-21)." Applicant respectfully submits that this teaching supports Applicant's argument that Hisamune teaches illumination of the substrate surface, and not merely illumination within the reaction chamber.

Hisamune seeks to deposit an insulating film on the surface of a substrate. Translation, p.5, ll. 17-18. Applicant teaches that reactants in a CVD process are adsorbed on the substrate surface where they undergo a film-forming chemical reaction. Specification, p. 2, ll. 23-24. If the UV irradiation is to induce a photochemical reaction, and film-forming reactions take place among reactant gases adsorbed on the substrate surface, the substrate surface must be illuminated to induce a photochemical film-forming reaction at the substrate surface. This is consonant with the process of Hisamune having a light source located directly above the substrate surface. While Hisamune recites "irradiating the inside of the reaction furnace," Applicant respectfully submits that such a blanket statement neither teaches nor suggests illuminating gases located within the reaction chamber *without* illuminating the substrate surface, given the teaching that the irradiation is provided to induce a photochemical reaction. Please note that Applicant believes that the optical excitation of the reaction volume of the gases selectively increases the concentration of ozone or free oxygen atoms in the reaction gas mixture, thus permitting illumination of other than the substrate surface. See specification, p. 7, l. 29 thru p. 8, l. 1.

The rejection further states that "it would have been obvious to choose the temperature of applicant's claimed process because Hisamune teaches temperatures near applicant's" Applicant respectfully submits that it has shown that Hisamune, standing alone, does not teach nor suggest a temperature near Applicant's deposition temperature.

In light of the foregoing, Applicant respectfully requests reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a), and allowance of claims 1-24.

CONCLUSION

Claims 25-29 are canceled hereby. Claims 1, 23, 24 and 30 are amended herein. Claims 1-24 and 30 are pending.

Applicant believes the claims are in condition for allowance and requests reconsideration of the application and allowance of the claims. The Examiner is invited to telephone the below-signed attorney at 612-371-2103 to discuss any questions which may remain with respect to the present application.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Box AF, Assistant Commissioner of Patents, Washington, D.C. 20231 on January 25 1998.

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